DOCUMENT RESUME

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AUTHOR	Rushton, Erik; Ryan, Emily; Swift, Charles
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ABSTRACT

Many of today's popular sports are based around the use of a ball yet none are alike. In fact, they are all designed with specific characteristics in mind. In this activity, students investigate different balls' ability to bounce and represent the data they collect graphically. This activity uses a time frame of 100 minutes. (Author/SOE)

Activity: **Ball Bounce Experiment**

GRADE LEVELS: 3-5

SUMMARY:

Many of today's popular sports are based around the use of a ball, yet none are alike. In fact they are all designed with specific characteristics in mind. Students will investigate different ball's ability to bounce and represent the data they collect graphically.

LEVEL OF DIFFICULTY [1 = Least Difficult: 5 = Most Difficult]

5 - most difficult

TIME REQUIRED

100 minutes (2 or 3 class periods)

COST

none, if all materials available from physical education department

STANDARDS:

1.1 Identify materials used to accomplish a design task based on a specific property (i.e. weight, strength, hardness, and flexibility).

2.2 Describe different ways in which a problem can be represented (e.g. sketches, diagrams, graphic organizers, and lists).

WHAT WILL THE STUDENTS LEARN?

How to run an experiment, how to collect data.

How to present data.

How to interpet graphs.

How to graph results.

Teamwork

BACKGROUND INFORMATION:

This lesson would coincide well with math graphing lessons.

Different types of balls bounce differently.

RESOURCES:

- http://wwwslap.cern.ch/doc/NExS/html/node260.html
  Description of different graph, i.e. line, scatter, bar, pie. Nice example pictures.
- http://www.mathleague.com/help/data/data.htm
  Examples of graphs and how to use different types, and how to calculate mean, medium, mode.
- http://nces.ed.gov/nceskids/Graphing/
  Allows children to create graphs and experiment with probability.

MATERIALS:

Four Different Balls to test: i.e. super ball, tennis ball, basketball, kickball, baseball etc.

1-stopwatch per group

1-yard stick per group

PREPARATION:

Collect materials and copy worksheets.

DIRECTIONS:

1. Explain the 2 tests that will be done to determine the bouncing properties of different balls.

2. Divide the class into groups of 3 students. One student will be the recorder, one will drop the ball, and one will be the timekeeper.

3a. Assign each group a ball. After running both tests on that ball, the group will switch balls (rotate) and test a new ball until all balls have been tested by each group.

3b. Conduct the tests.

TEST 1: BALL BOUNCE HEIGHT COMPARISON - The first time you drop the ball do not take a measurement, just watch were the ball goes so the next time the observer will be prepared where to look. This will help to greatly increase the acuracy of the experiements. Drop a ball from one foot off of the floor, slightly in front of a yardstick. Measure the height the ball reaches after the first bounce and record. Repeat this test from 2 ft, 3 ft, and 1/2 ft. Do this test for each ball and record data. You may have to try more than once to accurately judge the height of the first bounce.

TEST 2: BALL BOUNCE TIME COMPARISON - Drop a ball from a height of 3 ft, timing from when the ball is released until the ball stops bouncing. Record the time. Repeat this test for each ball. Talk with the students about coming up with a system for releasing the ball and starting the stop watch. Possible suggestions are to have the same student drop the ball and start the watch, or have the two studnets count down form 5.

5. Graph group results. (if this activity is not able to be accompanied by a math lesson on graphing you can introduce the topic before the activity starts or perhaps after the class has recorded all of its data and worked through it as a group.)

6. Compare results as a class.

INVESTIGATING QUESTIONS:

Could you play basketball with a superball?

Do smaller balls bounce higher?

Do heavier balls bounce higher?

Why are your results different from other groups results?

Why do some balls bounce higher than others?

What other tests can you perform with the balls?

Why is the design of a ball important?

REFERENCES:

None

Rubric for Performance Assessment

Activity Title: Ball bounce experiment

Grade Level: 3-5

	1	2	3		
Criteria	Developing	Proficient	Advanced	Weight (X factor)	Subtotal
Data Collection	Missing some data and doesn't appear accurate.	Data may not be completely accurate.	All data is collected for each ball. Everything is accurate.		
Cooperation	No group work.	Little contribution to group work.	Contributes as expected to group work.		
Results	Graphs not complete.	Graphs not completely accurate and not labeled completely,	All graphs accurate and well presented.		
				Total:	

Teacher Comments:

Characteristics of Balls

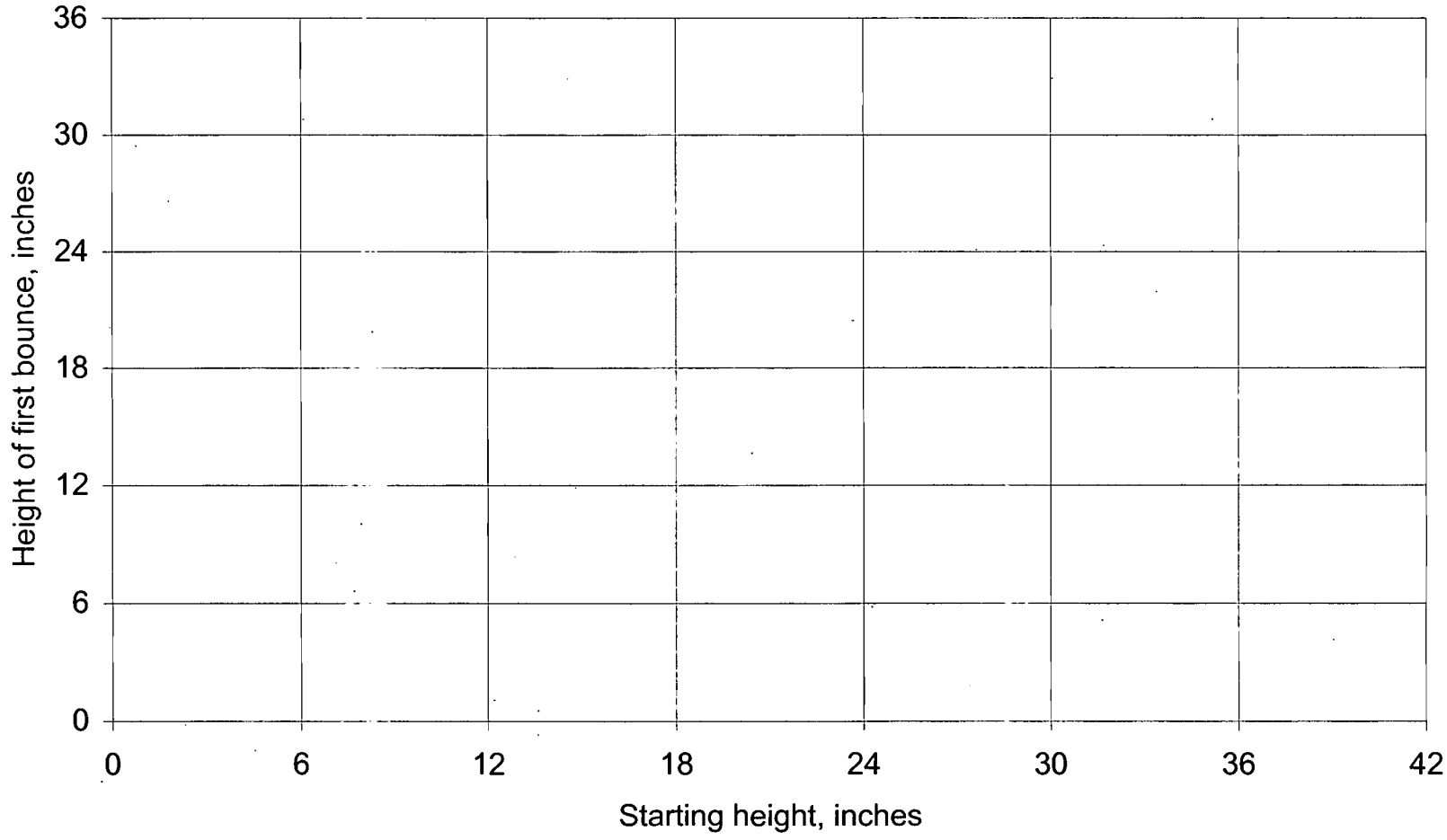
Name_____

BALL	MATERIAL	SIZE	COMPOSITION (HOLLOW OR SOLID)	WEIGHT (HEAVY OR LIGHT)

BALL BOUNCE EXPERIMENT 1

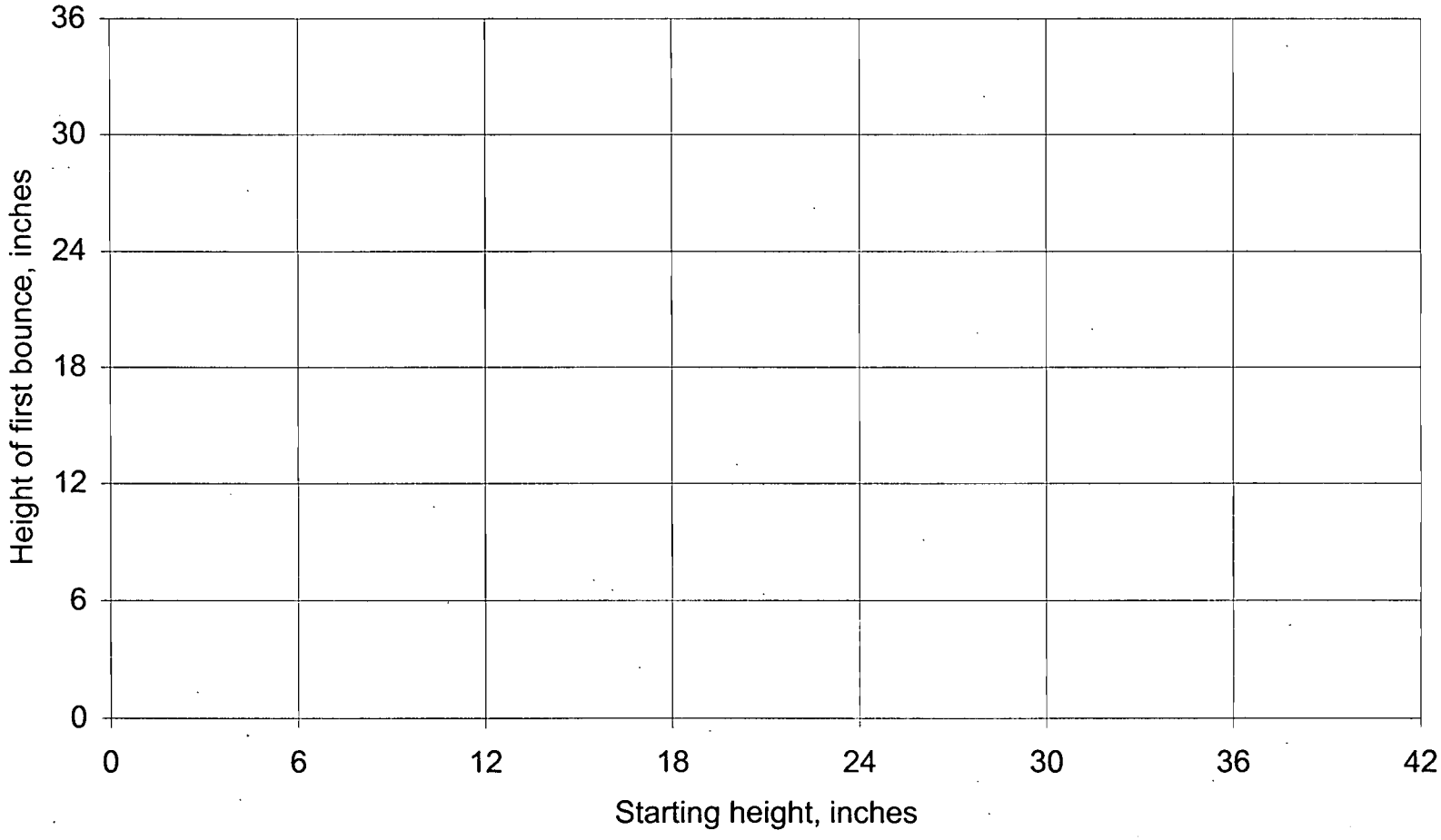
Name_____

BAR GRAPH COMPARING FIRST BOUNCE HEIGHT COMPARISON FOR BALL_____



BALL BOUNCE EXPERIMENT 1 Name_____

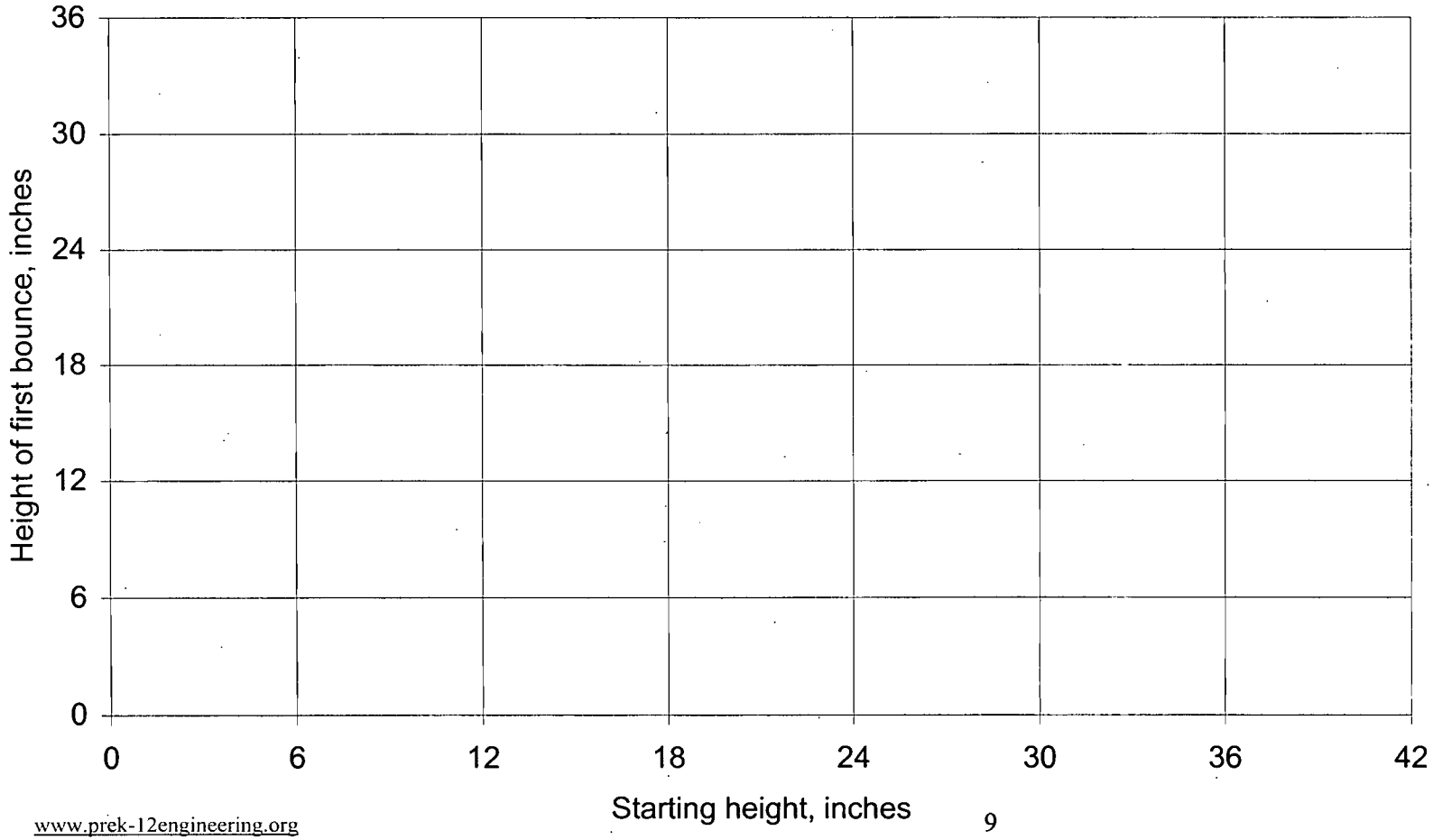
BAR GRAPH COMPARING FIRST BOUNCE HEIGHT COMPARISON FOR BALL_____



BALL BOUNCE EXPERIMENT 1

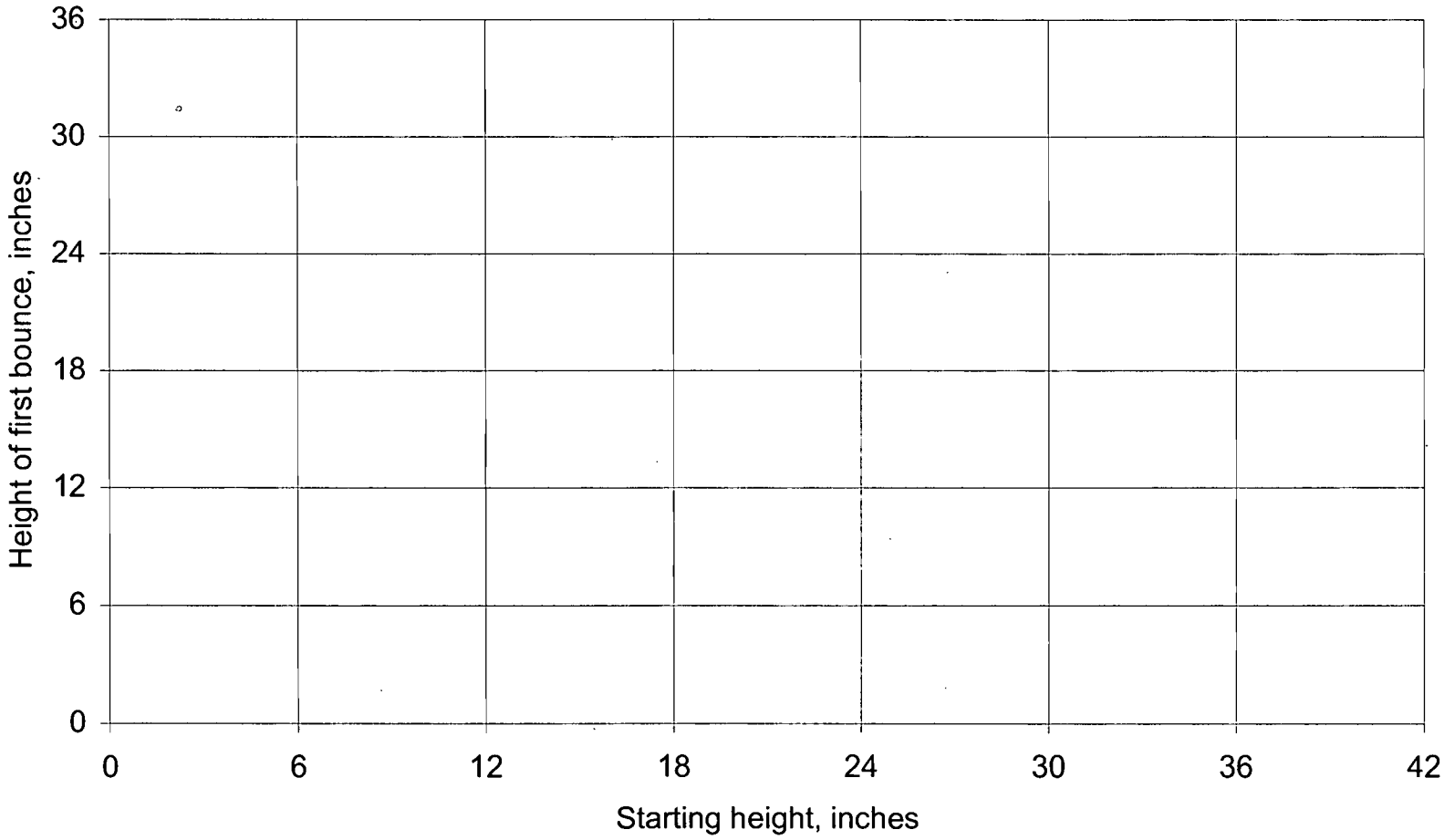
Name_____

BAR GRAPH COMPARING FIRST BOUNCE HEIGHT COMPARISON FOR BALL_____



BALL BOUNCE EXPERIMENT 1 Name_____

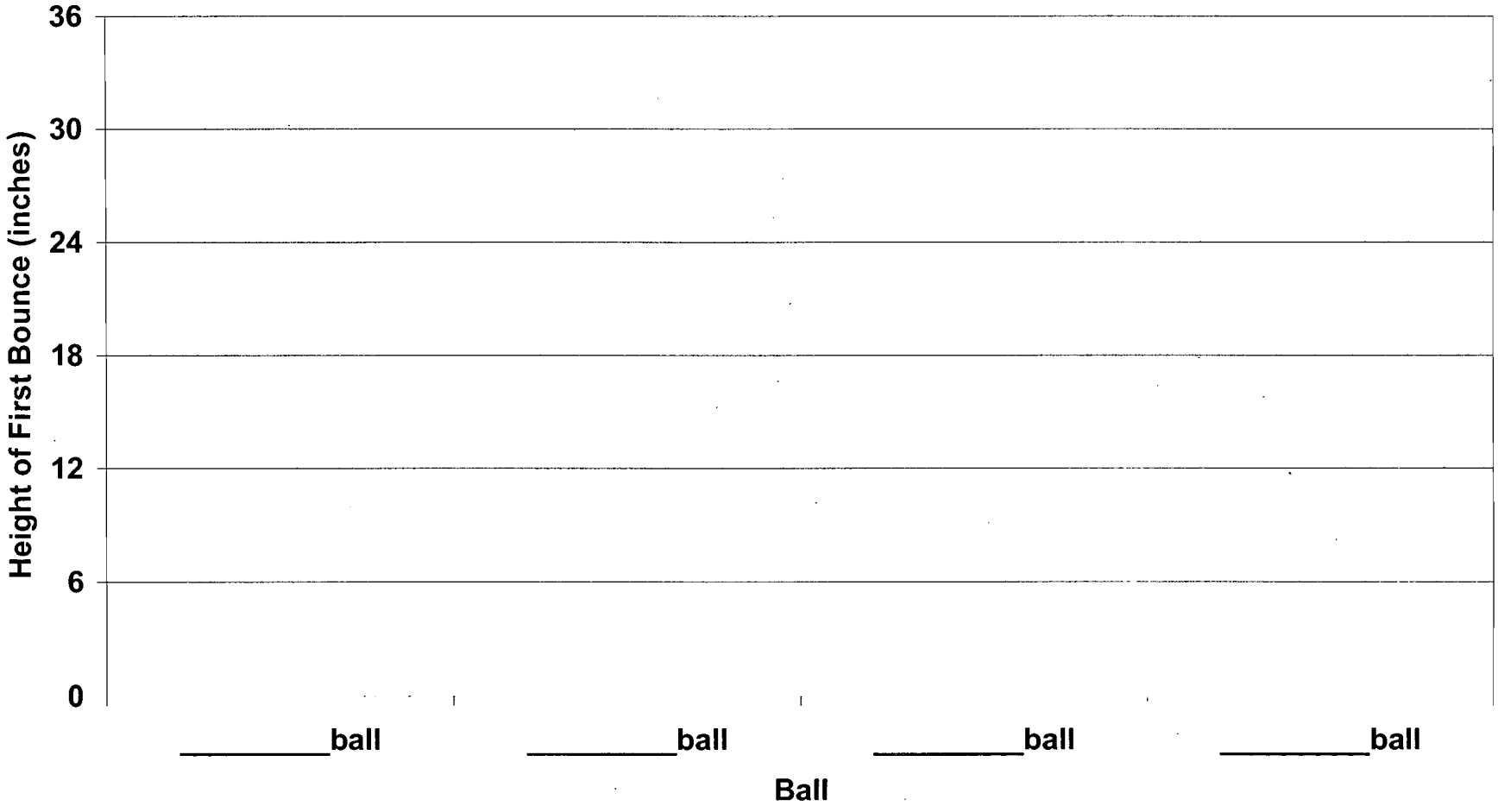
BAR GRAPH COMPARING FIRST BOUNCE HEIGHT COMPARISON FOR BALL_____



BALL BOUNCE EXPERIMENT 1

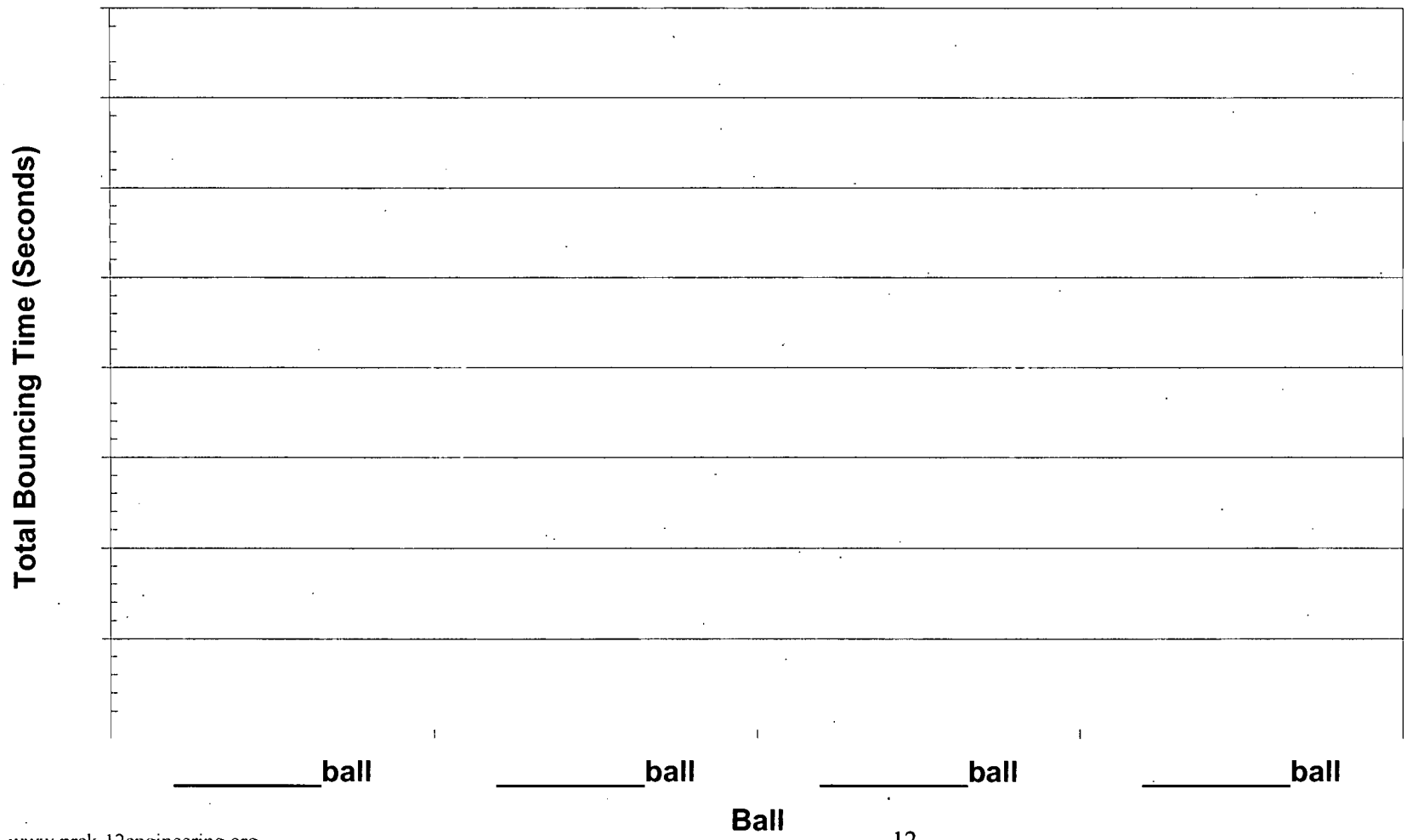
Name_____

BAR GRAPH COMPARING HEIGHT OF FIRST BOUNCE OF DIFFERENT BALLS AT 36 INCHES



BALL BOUNCE EXPERIMENT 2 Name_____

BAR GRAPH COMPARING BOUNCE TIMES FOR DIFFERENT BALLS



TEST ONE: BALL BOUNCE HEIGHT COMPARISON

Ball_____

Starting height (inches)	Height of first bounce (inches)
0 inches	
12 inches	
24 inches	
36 inches	

Ball_____

Starting height (inches)	Height of first bounce (inches)
0 inches	
12 inches	
24 inches	
36 inches	

Ball_____

Starting height (inches)	Height of first bounce (inches)
0 inches	
12 inches	
24 inches	
36 inches	

Ball_____

Starting height (inches)	Height of first bounce (inches)
0 inches	
12 inches	
24 inches	
36 inches	

TEST TWO: BALL BOUNCE TIME COMPARISON

Ball	Time until bouncing stops (seconds)

PreK-12 ENGINEERING

Activity Evaluation Form

www.k12engineering.org

Activity Name: _____

Grade Level the Activity was implemented at:_____

Was this Activity effective at this grade level (if so, why, and if not, why not)**?**

What were the Activity's strong points?

What were its weak points?

Was the suggested Time Required sufficient (if not, which aspects of the Activity took shorter or longer than expected)**?**

Was the supposed Cost accurate (if not, what were some factors that contributed to either lower or higher costs)**?**

Do you think that the Activity sufficiently represented the listed MA Framework Standards (if not, do you have suggestions that might improve the Activity's relevance)**?**

Was the suggested Preparation sufficient in raising the students' initial familiarity with the Activity's topic (if not, do you have suggestions of steps that might be added here)**?**

If there were any attached Rubrics or Worksheets, were they effective (if not, do you have suggestions for their improvement)**?**

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Title: PreK-12 Engineering Activities

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http://www.prek-12engineering.org/data/d2/Touchdiscover.pdf

2) Invent a Backscratcher from Everyday Materials, Grades PreK-2
http://www.prek-12engineering.org/data/d28/Backscratcher.pdf

3) Compare Human-Made Objects with Natural Objects, Grades PreK-5
http://www.prek-12engineering.org/data/d34/HumanvsNatural.pdf

4) Do Different Colors Absorb Heat Better?, Grades PreK-2
http://www.prek-12engineering.org/data/d37/Absorbheat.pdf

5) Which Roof is Tops?, Grades PreK-2
http://www.prek-12engineering.org/data/d44/RoofTops.pdf

6) Make Your Own Recycled Paper, Grades PreK-2
http://www.prek-12engineering.org/data/d56/Recycle.pdf

7) Build an Approximate Scale Model of an Object Using LEGOs, Grades 3-5
http://www.prek-12engineering.org/data/d3/LegoScaleModel.pdf

8) Design Weather Instruments using Lego Sensors, Grades 3-5
http://www.prek-12engineering.org/data/d4/LegoWeather.pdf

9) Space Shelter, Grades 3-5
http://www.prek-12engineering.org/data/d5/SpaceShelter.pdf

10) Build a Bird House, Grades 3-5
http://www.prek-12engineering.org/data/d6/BirdHouse.pdf

11) Ball Bounce Experiment, Grades 3-5
http://www.prek-12engineering.org/data/d6/BallBounce.pdf

12) Make an Alarm!, Grades 3-5
http://www.prek-12engineering.org/data/d11/MakeAlarm.pdf

13) Design Packing to Safely Mail Raw Spaghetti, Grades 3-5
http://www.prek-12engineering.org/data/d17/MailSpaghetti.pdf

14) Disassemble a Click Pen, Grades 3-5
http://www.prek-12engineering.org/data/d33/clickPen.pdf

15) Construct And Test Roofs for Different Climates, Grades 3-5
http://www.prek-12engineering.org/data/d35/ClimateRoof.pdf

16) Compare Fabric Materials, Grades 3-5
http://www.prek-12engineering.org/data/d36/Fabric.pdf

17) A House is a House for Me, Grades 3-5
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18) Water Filtration, Grades 3-5
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19) What is the Best Insulator: Air, Styrofoam, Foil, or Cotton?, Grades 3-5
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20) Design a Recycling Game!, Grades 3-5
http://www.prek-12engineering.org/data/d55/Recycling.pdf

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http://www.prek-12engineering.org/data/d7/TowerEgg.pdf

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23) Portable Sundial, Grades 6-8
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24) An Introduction To Loads Acting on Structures, Grades 6-8
http://www.prek-12engineering.org/data/d31/IntroLoads.pdf

25) Design Your Own Rube Goldberg Machine, Grades 6-8
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26) Building Tetrahedral Kites, Grades 6-8
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27) Do as the Romans: Construct an Aqueduct!, Grades 6-8
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29) Design a Parachute, Grades 6-8
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30) The Squeeze is On, Grades 6-8
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31) Stop The Stretching, Grades 6-8
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32) Speaker Project, Grades 9-10
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Author(s): Erik Rushton, Emily Ryan, Charles Swift

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Signature: Margaret Newell

Printed Name/Position/Title: Margaret Newell, Associate Provost for Research

Organization/Address: Tufts University
136 Harrison Avenue, Suite 75K-401
Boston, MA 02111

Telephone: 617-636-6550
Fax: 617-636-2917
E-mail Address: peter.wong@tufts.edu

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